CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. A method of fabricating a resistance variable memory element, comprising the steps of:

forming a layer of a resistance variable material; and

subsequently increasing the rigidity of said resistance variable material.

2. The method of claim 1 wherein said step of increasing the rigidity comprises the step of annealing said resistance variable memory element.

3. The method of claim 2 wherein said step of annealing comprises heating said resistance variable material to a temperature of about or below a thin-film glass transition temperature of said resistance variable material.

4. The method of claim 2 wherein said step of annealing comprises the step of heating said glass material to a temperature ranging from about 200°C to about 330°C for a time period ranging from about 5 to about 15 minutes.

5. The method of claim 4 wherein said time period is about 10 minutes.

6. The method of claim 2 wherein said step of annealing is performed in an atmosphere comprising oxygen.

7. The method of claim 1 wherein said resistance variable material comprises a germanium-selenide glass.

8. The method of claim 7 wherein said germanium-selenide glass has a stoichiometry between about $Ge_{20}Se_{80}$ and about $Ge_{23}Se_{77}$.

9. The method of claim 7 wherein said germanium-selenide glass has a germanium molar concentration number of equal to or less than about 0.23.

10. The method of claim 1 wherein after increasing the rigidity, said resistance variable material has a mean coordination number of at least about 2.46.

11. A method of fabricating a resistance variable element, comprising the steps of:

forming a layer of germanium-selenide glass;

incorporating silver into said germanium-selenide glass layer to form a silver-germanium-selenide glass; and

processing said silver-germanium-selenide glass to remove at least some selenium from said silver-germanium-selenide glass.

Sub B1

12. The method of claim 11 wherein said step of processing comprises heating said silver-germanium-selenide glass to a temperature at or below a thin-film glass transition temperature of said silver-germanium-selenide glass.

13. The method of claim 11 wherein heating is performed in an atmosphere comprising oxygen.

14. The method of claim 11 wherein after heating said silver-germanium-selenide glass, said silver-germanium-selenide glass has a mean coordination number of at least about 2.46.

15. The method of claim 11 wherein said processing comprises annealing said silver-germanium-selenide glass at a temperature ranging from about 200°C to about 330°C for a time period ranging from about 5 to about 15 minutes.

16. The method of claim 15 wherein said time period is about 10 minutes.

17. The method of claim 11 wherein said germanium-selenide glass layer has a stoichiometry range from between about $Ge_{20}Se_{80}$ and about $Ge_{23}Se_{77}$.

18. The method of claim 11 wherein said germanium-selenide glass layer has a germanium molar concentration number of about 0.23 or less prior to said processing.

19. The method of claim 11 wherein after removing at least some selenium from said silver-germanium-selenide glass, said silver-germanium-selenide glass has a germanium molar concentration number greater than about 0.23.

20. A method of forming a resistance variable memory element comprising the steps of:

forming a first electrode;

forming an insulating layer over said first electrode;

etching an opening in said insulating layer to expose said first electrode;

depositing a resistance variable material in said opening;

adding a metal to said resistance variable material to form a metal containing resistance variable material;

increasing the rigidity of said metal containing resistance variable material; and

forming a second metal electrode in contact with said metal containing resistance variable material.

21. The method of claim 20 wherein said step of increasing rigidity comprises annealing said metal containing resistance variable material.

22. The method of claim 21 wherein said step of annealing is performed in an atmosphere comprising oxygen.

Sub B2

23. The method of claim 21 wherein said step of annealing comprises the step of heating said metal containing resistance variable material to a temperature at or below a thin-film

glass transition temperature of said metal containing resistance variable material.

24. The method of claim 21 wherein said step of annealing comprises the step of heating said metal containing resistance variable material to a temperature ranging from about 200°C to about 330°C for a time period ranging from about 5 to about 15 minutes.

25. The method of claim 24 wherein said time period is about 10 minutes.

26. The method of claim 20 wherein after said step of increasing the rigidity, said metal containing resistance variable material has a mean coordination number of at least about 2.46.

27. The method of claim 20 wherein said resistance variable material comprises a germanium-selenide composition.

28. The method of claim 27 wherein the step of increasing the rigidity comprises removing at least some selenium from said germanium-selenide composition.

29. The method of claim 27 wherein the step of increasing the rigidity comprises changing the stoichiometry of said germanium-selenide composition.

30. The method of claim 20 wherein the step of increasing the rigidity comprises changing the stoichiometry of said resistance variable material.

31. The method of claim 27 wherein said germanium-selenide composition has a stoichiometry range between about $Ge_{20}Se_{80}$ and about $Ge_{23}Se_{77}$.

32. The method of claim 27 wherein said germanium-selenide composition has a germanium molar concentration number of about 0.23 or less prior to said increasing step.

33. The method of claim 32 wherein said germanium-selenide composition has a germanium molar concentration of greater than about 0.23 after said increasing step.

34. A resistance variable memory element comprising;

a first electrode;

an annealed silver-germanium-selenide glass in electrical communication with said first electrode; and

a second electrode in electrical communication with said annealed silver-germanium-selenide glass.

Sub B3

~~35. The device of claim 34 wherein said glass has a germanium molar concentration number greater than about 0.23.~~

~~36. The device of claim 34 wherein said glass has a mean coordination number of at least about 2.46.~~

37. A chalcogenide element comprising:

an annealed silver doped germanium-selenide glass, wherein said glass has a germanium molar concentration number of greater than about 0.23.

38. A chalcogenide element comprising:

an annealed silver doped germanium-selenide glass, wherein said glass has a mean coordination number of at least about 2.46.

39. A resistance variable element comprising:

an annealed metal containing resistance variable material having an increased rigidity.

A4

~~40. The device of claim 39 wherein said metal is silver.~~

~~41. The device of claim 39 wherein said annealed metal containing resistance variable material comprises a germanium-selenide glass.~~

~~42. The device of claim 41 wherein said germanium-selenide glass has a germanium molar concentration number of greater than about 0.23.~~

~~43. The device of claim 39 wherein said annealed metal containing resistance variable material has a mean coordination number of at least about 2.46.~~

5b A4

44. The device of claim 39 wherein said annealed metal containing resistance variable material comprises a silver doped germanium-selenide.

45. A resistance variable element comprising:

an annealed metal containing resistance variable material having an increased rigidity;

at least one access transistor and at least one capacitor for storing a data value which is associated with said access transistor, and

at least one metal plug electrically connected to an active area of said transistor.

Sb A5

46. The device of claim 45 wherein said metal comprises silver.

47. The device of claim 45 wherein said annealed metal containing resistance variable material comprises a germanium-selenide glass.

48. The device of claim 47 wherein said germanium-selenide glass has a germanium molar concentration number of greater than about 0.23.

49. The device of claim 45 wherein said annealed metal containing resistance variable material has a mean coordination number of at least about 2.46.

Sub A5

50. The device of claim 45 wherein said annealed metal containing resistance variable material comprises a silver doped germanium-selenide.

51. A computer having a memory, said memory comprising:

an annealed metal containing resistance variable material having increased rigidity.

52. The device of claim 51 wherein said metal comprises silver.

53. The device of claim 51 wherein said annealed metal containing resistance variable material comprises a germanium-selenide glass.

54. The device of claim 53 wherein said germanium-selenide glass has a germanium molar concentration number of greater than about 0.23.

55. The device of claim 51 wherein said annealed metal containing resistance variable material has a mean coordination number of at least about 2.46.

56. The device of claim 51 wherein said annealed metal containing resistance variable material comprises a silver doped germanium-selenide.

57. A resistance variable element comprising:

an annealed resistance variable material having an increased rigidity.

Sub A6

~~58. The device of claim 57 wherein said annealed resistance variable material comprises silver.~~

~~59. The device of claim 57 wherein said annealed resistance variable material comprises a germanium-selenide glass.~~